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PETROGRAPHY.¹

Ancient Volcanic Rocks in Pennsylvania.—Reference has already² been made in these notes to the discovery of ancient acid and basic volcanic lavas and tuffs at South Mountain, Pa. Miss Bascom³ has recently given an exhaustive account of all the types of these rocks, which account is beautifully illustrated by reproductions of microphotographs and of colored drawings, and by a large scale geological map. The volcanic lavas are partly devitrified rhyolites and partly altered basalts. A brief notice of the former was given several years ago.⁴ The present report adds much of detailed information concerning them to that already imparted, but nothing of general interest. These lavas are pre-Cambrian, and are probably older than the basic rocks with which they are associated in the Monterey district. The basic lavas were originally diabases, augite-porphyrates and melaphyres. They have suffered extreme alteration in consequence of weathering and also as a result of squeezing. Nearly all the rocks are schistose, the most highly schistose ones being now practically slates.

Rocks Associated with the Magnetites near Port Henry, N. Y.—The rocks associated with the non-titaniferous magnetites at Mineville and near Port Henry, N. Y., are described by Kemp⁵ as gneisses and gabbro. Four varieties of the gneiss are distinguished, of which three are acid and one basic. One of the acid gneisses consists of quartz and plagioclase exclusively. Another is composed of these minerals and a large proportion of micro-perthite, and the third of brown hornblende, green augite and rarely hypsthene, in addition to the feldspars and quartz. The basic gneiss is a schistose gabbro. It grades into the massive gabbro. In some phases hornblende and much garnet are present. All the gneisses, as well as the gabbro, are thought to be igneous in origin and to be pre-Cambrian in age. The ore deposits are on the contact of the acid and the basic rocks. While their method of origin is not certainly known, it is believed by the author that the ores may be contact products resulting from the action of the intrusive gabbro upon the gneisses intruded by it.

¹ Edited by Dr. W. S. Bayley, Colby University, Waterville, Me.

² *American Naturalist*, 1894, pp. 515, 517 and 949.

³ *Bull. U. S. Geol. Survey*, No. 136, Washington, 1896.

⁴ *American Naturalist*, p. 515.

⁵ *Trans. Amer. Inst. Min. Eng.*, 1897.

The Basalts of Klöch in Steiermark.—The main portions of the Klöch Mountain mass are basalts and their tuffs. Sigmund⁶ describes these and the other rocks in their vicinity as nepheline basanites, palagonite tuffs, nephelinites and nepheline basalts.

All the augites in the basanites have the "hourglass form," and all the feldspars are bytomites. The augites are also zonal with a colorless nucleus and a violet-gray peripheral portion. The extinction of the nucleus is higher than that of the surrounding portion, and the extinction in the pyramidal zone of growth (Anwachs-Kegel) greater than that in the prismatic zone. The nephelinite of the Hochstraden contains two augites. The larger consists of colorless nuclei and greenish-yellow peripheral zones, while the smaller ones are composed entirely of the greenish-yellow material. Hauyn is an essential component of the groundmass. In some specimens it occurs in as large quantity as the nepheline. An analysis of this rock gave:

SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	SO ₃	Cl.	Loss	Total
40.99	2.41	16.50	10.62	.35	3.29	12.63	5.95	2.36	.89	.64	.36	2.63	= 99.62

The basalt of Klöch and the nephelinite of the Hochstraden are thought to have been produced by the differentiation of one magma.

The Volcanic Rocks near Bensen, Bohemia.—Hibsch,⁷ in his description of the Bensen sheet of the Bohemian Mittelgebirge, gives brief accounts of the basalts, augitites, tephrites, basanites, phonolites and trachytes occurring as lavas and tuffs, and of the camptonitic, trachyte-andesitic and tinguaitic dykes so common in the district. The basalts, which are the oldest lavas, form stocks, sheets and dykes; the tephrites, which are the next older, occur in sheets and as tuffs, and the phonolites and trachytes as bosses. The tinguaitic dykes are connected with the phonolitic intrusion at Mühlörzen, but the others are more closely connected with the volcanic center at Rongstock. All the eruptives are Tertiary or younger. The most interesting of these rocks is in the trachyte-andesite dyke. The author describes it under the name of gauteite, and regards it as the complementary form to the monchiquites. It is a rock of a light color and trachytic habit. In composition it differs from bostonite-porphyry in the possession of phenocrysts of plagioclase. It consists of large porphyritic crystals of hornblende, augite, plagioclase and occasionally biotite in a groundmass composed of the same dark minerals, sanidine and andesine, cemented by glass. An analysis yielded:

⁶ Min. u. Petrog. Mittheilungen, XV, p. 361 and XVI, p. 337.

⁷ *Ib.*, B., XVII, p. 1.

SiO ₂	TiO ₂	P ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃	FeO	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O	Total
54.15	tr.	.41	18.25	3.62	2.09	4.89	2.56	6.56	4.43	3.69	= 100.65

Density = 2.632

The basalts include feldspathic, nephelinic and magma basalts, analysis of the first two of which are here given :

SiO ₂	TiO ₂	P ₂ O ₅	Al ₂ O ₃	Fe ₂ O ₃	FeO	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O	CO ₂	Total
42.75	2.13	tr.	17.24	8.10	5.88	11.14	6.17	2.48	4.21	1.06		= 101.16
39.33	1.01	.93	15.26	6.36	5.99	14.52	9.78	1.53	3.47	2.54	0.12	= 100.84

The tephrites are phonolitic and basaltic hauyne-tephrites, sodalite-tephrites, nepheline-tephrites and leucite-tephrites. The phonolite contains great quantities of anorthoclase in large crystals. Some phases of the rock are noticeable for their phenocrysts of sodalite and others for their phenocrysts of nepheline. The other rocks possess no special features.

The Law Governing the Production of Zonal Crystals.—

The law governing the occurrence of zonally developed crystals is as follows, according to Becke⁸: In the zonally developed isomorphous mixed crystals of igneous rocks the more difficultly fusible components constitute the nuclei, and the more easily fusible ones the peripheral zones of the crystals.

Petrographical Notes.—Diller⁹ has discovered a boulder of hornblende-basalt in Kosk Creek at the great bend of Pitt River in Shasta Co., Cal. It is interesting not so much because of its features, but because of the rarity of the type in the district. An analysis yielded :

SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	CaO	MgO	K ₂ O	Na ₂ O	H ₂ O	P ₂ O ₅	Total
44.77	.53	17.82	5.05	6.95	tr.	10.36	8.22	.92	2.13	2.64	.72	= 100.11

The Seychelles Islands in the Indian Ocean are described by Bauer¹⁰ as being composed principally of hornblende, granite and of syenite cut by dykes and covered in places by sheets of granite-porphry, felsite-porphry, syenite-porphry, hornblende-vogesite, diorite, quartz-diorite, diabase, melaphyre and dolerite. The sedimentary rocks on the island are in very small quantity. They consist mainly of andalusite-hornfels and other contact rocks.

⁸ Min. u. Petrog. Mitth., Vol. XVII, 1897, p. 97.

⁹ Amer. Geologist, Vol. XIX, 1897, p. 253.

¹⁰ Sitzb. Ges. z Beförd gesammnt. Naturw. zu Marburg, Feb., 1897.